

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



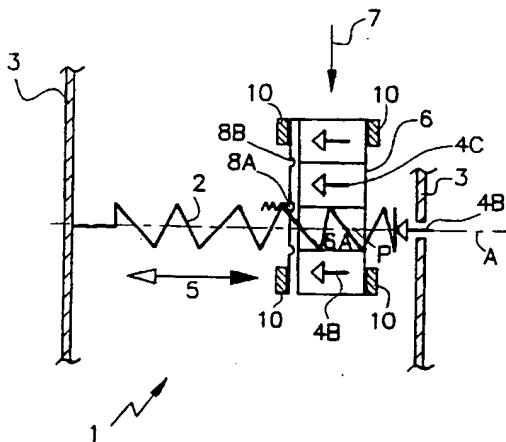
(43) International Publication Date
4 January 2001 (04.01.2001)

PCT

(10) International Publication Number
WO 01/00090 A1

- (51) International Patent Classification⁷: A61B 5/15
- (21) International Application Number: PCT/NL99/00403
- (22) International Filing Date: 30 June 1999 (30.06.1999)
- (25) Filing Language: English
- (26) Publication Language: English
- (71) Applicant (for all designated States except US): NED-ERLANDSE ORGANISATIE VOOR TOEGEPAST-NATUURWETENSCHAPPELIJK ONDERZOEK TNO [NL/NL]; Schoemakerstraat 97, NL-2628 VK Delft (NL).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): VOS, Hester [NL/NL]; Stationsweg 11, NL-2515 BG Den Haag (NL).
- (74) Agent: OTTEVANGERS, S., U.; Vereenigde, Nieuwe Parklaan 97, NL-2587 BN The Hague (NL).
- (81) Designated States (national): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:
— With international search report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: PRICKING DEVICE, CARRIER AND CASSETTE COMPRISING A PLURALITY OF LANCETS



(57) Abstract: Pricking device, comprising a hand holdable body (3) having propelling means (2) for engaging a lancet (4) in a skin puncturing, pricking movement relative to the body (3). The pricking device is arranged to hold a plurality of lancets (4) and comprises indexing means (7) for indexing said lancets (4), such that the lancets (4) can each be positioned in an operating position to be engaged in the pricking movement. In a preferred embodiment, the pricking device is arranged to hold a cassette (6) comprising a carrier carrying a plurality of lancets (4). The invention also relates to a cassette and/or carrier comprising a plurality of lancets.

WO 01/00090 A1

Title: Pricking device, carrier and cassette comprising a plurality of lancets.

The invention relates to a pricking device, comprising a hand holdable body having propelling means for engaging a lancet in a skin puncturing, pricking movement relative to said body.

5 Such a pricking apparatus is generally known and is e.g. used by the diabetic for puncturing the skin of their finger tips. By puncturing the skin, a drop of blood can be obtained which can subsequently be analysed with a blood
10 glucose meter to measure the blood sugar level. On the basis of the measured blood sugar level, a diabetic can determine the amount of insulin needed.

 The known pricking device comprises a substantially pen-shaped body that is arranged to hold a single lancet, i.e. a singular needle-shaped object. The propelling means
15 comprise a spring-loaded plunger which can engage a lancet in a substantially linear pricking movement along the axis of the pen. In use, a protective cap is removed from the lancet and the lancet is inserted into the pricking device. Next, the spring is compressed. Subsequently, the pen is placed
20 with the section comprising the lancet close to the skin at the finger tip. Then, the spring is released and the lancet is engaged in a skin puncturing, pricking movement. After a lancet has been engaged in a pricking movement, it needs to be substituted for a new one and the used lancet needs to be
25 disposed off properly. Depending on the condition of the diabetic, the pricking device has to be used up to 3 times a day.

 A problem associated with the known pricking device is that many diabetic find changing of the lancet a time
30 consuming, troublesome operation. In preparation of a pricking movement, the pricking device needs to be opened, the protective cap needs to be removed from a fresh lancet, the lancet needs to be inserted in the pricking apparatus and the pricking apparatus needs to be closed. After performing

the pricking operation, the used lancet needs to be removed from the pricking device, the protective cap needs to be replaced and the used lancet needs to be disposed off properly.

5 The above operations are particularly troublesome for a large group of elderly diabetic, whose eye-sight has deteriorated and whose fine motor skills are often insufficient. In addition, performing the above act is rendered even more troublesome when the diabetic's digits are
10 punctured in a number of places. A further problem associated with the known apparatus is that a relatively large number of lancets need to be carried with the pricking device, which causes a problem to the diabetic since he or she already has to carry a rather large number of other devices, such as a
15 blood glucose meter, analysing strips, insulin cartridges and an insulin injector.

 In view of the above, many diabetic do not use the pricking device as often as necessary, which has a serious deteriorating effect on their condition. Furthermore, many
20 diabetic do not change the lancet after each use. This largely increases the pain involved in puncturing the skin, since the lancet becomes blunt. In addition, the chance of the punctures becoming infected is greatly increased.

 The object of the invention is to provide a pricking
25 device in which the above-mentioned problems can be alleviated. According to the invention, the pricking device is thereto arranged to hold a plurality of lancets and comprises indexing means for indexing said lancets, such that each lancet can be positioned in an operating position
30 wherein it can be engaged in a pricking movement.

 This way, loading the pricking device with fresh lancets and disposing of the used lancets can be concentrated in one action, which greatly reduces the time needed and renders the operations less troublesome. Furthermore, loading
35 and unloading of the pricking device with lancets can be performed at a convenient place and time. After loading of

the apparatus with lancets, a diabetic only needs to bring a new lancet in the operating position, e.g. by pressing the loading button before each pricking operation, which greatly increases the chance that the diabetic will use the pricking device when necessary and that the diabetic will use a fresh lancet for each pricking operation.

By providing a mechanism for automatically indexing the lancets after each pricking movement of the pricking device, the use of a fresh lancet for each subsequent pricking operation can be enforced.

By arranging the pricking device to hold a carrier and/or a cassette comprising a plurality of lancets, loading and unloading of the pricking device with lancets can be facilitated further. By providing each lancet with a pierceable closure, each lancet can be provided with a sterile environment surrounded by said closure, which environment can be pierced by the lancet during the pricking movement. The invention also relates to a carrier and/or cassette comprising a plurality of lancets.

It should be noted that the definition of the word lancet as used in this context is to comprise at least any substantially needle like object suitable for puncturing the skin, which needle like object may or may not be provided on a carrier.

The invention will be elucidated with the aid of a drawing. In the drawing is:

Fig. 1A a schematic diagram of a mechanism for a first embodiment of a pricking device according to the invention;

Fig. 1B a schematic diagram of a mechanism for a second embodiment of the pricking device according to the invention;

Fig. 2A a plan view of a detailed embodiment of a pricking apparatus according to the invention;

Fig. 2B a planar longitudinal cross-section of the apparatus as shown in Fig. 2A;

Fig. 2C a side elevational view of the apparatus of Fig. 2A;

Fig. 2D an elevated longitudinal cross-section of the apparatus as shown in Fig. 2C;

5 Figs. 3AA and 3AB respectively a side and a plan view of a wheel carrying lancets;

Figs. 3BA and 3BB respectively a side and a plan view of a wheel carrying lancets that is blocked against re-use;

10 Figs. 3CA and 3CB respectively a side and a plan view of a wheel carrying lancets that are each covered by a pierceable closure;

Figs. 3DA, 3DB and 3DC respectively a plan view, a side view and a bottom view of a cassette with a wheel carrying lancets for use in the pricking device shown in
15 Figs. 2;

Figs. 3EA and 3EB respectively a side and a bottom view of a cassette according to Figs. 3D during use;

Fig. 3EC a plan view of a cassette comprising cap-like closures and a cutter for cutting the cap-like closures;

20 Figs. 3FA and 3FB a lateral cross-section of a pricking apparatus according to Figs. 2 with its cassette holder in open position ready for insertion of a cassette and with an inserted cassette respectively;

25 Figs. 4A - 4D a planar longitudinal cross-section of the pricking device according to Figs. 2 in for consecutive stages of loading and indexing;

Figs. 5A and 5B an elevated longitudinal cross-section of the pricking device of figs. 2 with the propelling means in locked position and the propelling means being
30 released respectively;

Figs. 6A and 6B a planar cross-section of the pricking device according to Figs. 2 in respectively a starting position of the pricking movement and a reversing position of the pricking movement;

35 Figs. 6C and 6D each an elevated longitudinal cross-section corresponding to Figs. 6A and 6B respectively;

Figs. 7A - 7C a side view of the head portion 64 driving the counter 37 during three subsequent steps of operation;

Fig. 7D a plan view of the counter shown in Fig. 7C;

5 Figs. 8A and 8B an elevated longitudinal cross-section of the pricking device according to figs. 2 in closed and open position respectively; and

Fig. 8C a detail of Fig. 8A.

To enhance clarity, in some drawings a number of
10 parts has been omitted. The drawings are schematic representations of preferred embodiments of the invention. In the drawings, identical or corresponding parts are indicated with the same reference numerals or have equal extensions.

Fig. 1A shows a schematic diagram of a mechanism for
15 a first embodiment of a pricking device 1 according to the invention. The diagram shows propelling means, embodied as a linear compression spring 2, attached to the body 3 of the device 1. In the diagram, the propelling means 2 engage a lancet 4B in a skin puncturing, substantially linear pricking
20 movement relative to the body 3 along the direction of the double headed arrow 5.

The pricking device 1 is arranged to hold a plurality of lancets 4 in a substantially rectangular cassette 6. The lancets 4 can be positioned loosely in the cassette or they
25 can be attached thereto, e.g. via a carrier carrying one or more lancets. It should be noted that such a carrier directly carrying a plurality of lancets may also be used instead of a cassette.

The lancets 4 are aligned with their longitudinal
30 axes substantially parallel in the cassette 6. After the lancet 4B has been engaged in a pricking movement, the propelling means 2 are retracted in the direction of the open head of the double headed arrow 5. The lancet 4 which has just been used is automatically retracted into its
35 compartment 6A of the cassette 6. Subsequently, the cassette 6 can be indexed manually in the direction of arrow 7 along

guides 10 until the spring loaded notch 8A engages a recess 8B in the cassette 6, indicative of a fresh lancet 4C being positioned in the operating position P. In the operating position P, the fresh lancet 4C can be engaged in a subsequent pricking movement by the propelling means 2. Upon indexing, the used lancet 4A is shifted further away from the operating position. In this embodiment, the indexing means thus comprise means for translating the cassette 6, guides 10 for guiding the cassette 6 and a notch 8A for engaging the recesses 8B of the cassette. In order to achieve the pricking movement, the spring 2 is compressed and subsequently released by means of a compression mechanism and a release mechanism, which are not shown in the drawing. Such compression and releasing mechanisms are known to the skilled man and are therefore not discussed in detail.

The lancets 4 can also be inserted in a magazine or tray forming part of the pricking device 1, but are advantageously contained in a cassette 6. The cassette 6 may be disengaged from the pricking device when all lancets 4 have been engaged in a pricking movement, and may subsequently be changed for a fresh cassette 6 containing only unused lancets. It shall be clear to the skilled man that it is also possible to arrange the lancets with their axes substantially parallel along an arc or in a revolver type, cylindrical magazine. Furthermore, it shall be clear to the skilled man that the lancets may also be aligned with their axes substantially coaxial, such that after a first lancet has been engaged in a pricking movement, a subsequent lancet can be indexed in the operating position P to be engaged in a pricking movement by removing the used lancet. In such an embodiment, the indexing movement is substantially coaxial with the axis A along which the pricking movement is performed, whereas in the embodiment shown in Fig. 1A the indexing movement is substantially lateral relative to the axis A.

Fig. 1B shows a schematic diagram of another embodiment of a pricking device according to the invention wherein the pricking device 1 is arranged to hold a plurality of lancets 4 having their axes disposed in a substantially radial direction relative to a central axis 11. Preferably, as shown, the lancets are disposed along the circumference of a wheel. The lancets 4 are rotationally disposed relative to the central axis 11, such that they can be indexed by rotation in the direction of the arrow 12. In the drawing, a fresh lancet 4B has just been indexed in the direction of arrow 12 such that it was positioned in the operating position P and is now engaged in a pricking movement, i.e. a substantially linear, skin puncturing movement outward relative to the body 3. In this embodiment, the indexing means comprise axis 11, means for driving the wheel to rotate, e.g. a crank, and means for locking the wheel when a lancet is in the operating position, e.g. a notch co-operating with a cogwheel associated with the axis 11.

A more detailed description of a pricking device 1 having a mechanism, operating along the principles of Fig. 1B, as well as a cassette for such a pricking device arranged to hold a plurality of lancets is discussed in the following paragraphs.

With reference to Figs. 2A - 2D a pricking device 21 according to the invention is shown on an enlarged scale. The pricking device 21 comprises a body 23 that can be held in or with the palm of a person's hand, having a loading button 31 for loading the propelling means 22 and a pricking aperture 32 through which a lancet 4 can perform a linear skin puncturing pricking movement outward relative to the body 32. The body 23 further comprises a status window 33 through which a status indicator 34 can be observed and a counter window 35 through which the digits 36 of a counter 37 can be read. The body 23 further comprises a firing button 38 through which a releasing mechanism 39 for releasing the propelling means 22 can be actuated.

The pricking aperture 32 is provided in an adjustable head portion 40 which can be rotated relative to the body 23 to adjust the length through which a lancet 4 can maximally protrude through the pricking aperture 32 at the turning point of its outward pricking movement, thus providing a control for the depth a lancet 24 can puncture the skin. Such an adjustable head portion is known per se. The head portion 40 is provided with digits 41 on its circumference, which digits 41 correspond with an indicator 42 to indicate the position of the adjustable head portion 40 relative to the body 23, i.e. the pricking depth. The pricking device 21 further comprises a cassette holder 44 for holding a cassette 26 comprising a plurality of lancets 24. The cassette holder 44 is connected to the body 23 through compression springs and is locked in closed position using a latch mechanism 43. The pricking device 21 comprises indexing means 45 for indexing the lancets 24 in the cassette 26, such that each lancet 24 can each be positioned to an operating position P wherein it can be engaged in a pricking movement through the pricking aperture 32.

In the following, first the cassette 26 will be discussed in detail, whereafter the loading of the propelling means and the indexing of the lancets are discussed, followed by a discussion of the release mechanism and the pricking movement. Finally, the working of the counter is set out and the ejecting movement of the cassette holder 44 is shown.

Referring to Figs. 3A - 3F, a cassette 26 is shown having a wheel 46 on the circumference of which a plurality of lancets 24 is disposed having their axes extend radially outward relative to the centre of the wheel 46. In the centre of the wheel 46 an octagonal aperture 47 is located which fits around a corresponding octagonal axis 48 of the pricking device 26. It shall be clear that the number of lancets 26 disposed on the circumference of the wheel 46 can be chosen differently, and that instead of a wheel a different carrier may be used for carrying the plurality of lancets.

The aperture 47 may, as shown in Fig. 3AB, contain a seal 49 which is broken when an axis 48 is inserted in the aperture 47. When, after use, the wheel 46 is disengaged from the axis 48, a catch 50 which was held in place by the seal 49 is then pushed into the aperture 47 by a spring 51, such that the wheel 46 cannot be engaged again by the axis 48. This way, re-use of a wheel of which at least one lancet has been engaged in a pricking movement can be prevented. It shall be clear that such means blocking re-use can be designed in numerous ways.

As shown in Figs 3C each lancet 24 is provided with a pierceable closure 52 maintaining an air tight, preferably sterile environment around the lancet 24. The pierceable closure 52 can be punctured by the lancet 24 when it protrudes through the pricking aperture 32. Preferably, the pierceable closure 52 is made out of (sterile) foil. It shall be clear that the closure need not be pierceable but can also be provided as a cap that can be removed or cut. Furthermore, it should be noted that a pierceable closure 52 may also be used advantageously to provide a conventional, singular lancet disposed on a carrier with a pierceable air tight or sterile environment.

As shown in Figs. 3D the wheel 46 may be placed in a cassette 26. This way, the carrier or wheel can easily be gripped and the risk of accidentally contacting the lancets 24 and/or unintentionally piercing the pierceable closures 52 is greatly reduced. By providing the cassette 26 with an asymmetrical shape, e.g. by providing a protrusion 53 the cassette 26, it can be ensured that the cassette 26 can only be held by the cassette holder 44 in the proper orientation. The wheel 46 is rotatably and slidably positioned in the cassette holder by means of a slot 54 that co-operates with axial protrusion 55. This way, the lancets can be indexed by rotating them towards an operating position P. In the operating position P, during a pricking movement the wheel 46 slides along the slot 54, such that a lancet that is in the

operating or pricking position P, can perform a substantially linear pricking movement. This is shown in Fig. 3E. To enable the wheel 46 to slide out of the cassette 26 in a pricking movement, one side of the cassette 26 is provided with an aperture 57. The aperture 57 can e.g. initially be closed off with a removable seal 56. Opposite the slot 54, a notch 67 is present to center the wheel within the cassette in the starting position shown in fig. 3DC. It should be noted that the protrusion 55 may be omitted. Fig. 3EC shows a cassette comprising a cutter C for cutting the cap-like closures 52 of lancets 24 each time the wheel 46 is indexed and a lancet 24 is brought into the operating position P.

To insert the lancets 24 in the pricking device 21, the cassette 26 is simply inserted in an corresponding opening in the cassette holder 44, as is shown in Fig. 3F. To facilitate insertion of the cassette 26 into the cassette holder 44, the cassette holder may be arranged to slide outwards relative to the body 23 under the action of springs 58. Upon closing of the cassette holder 44, the octagonal aperture 47 of the wheel 46 is engaged by the axis 48.

Referring to Figs. 4A - 4D the loading and indexing movement of the pricking device 21 is shown. The pricking device 21 comprises a torsion spring 59 as principal component of the propelling means 22. To load the torsion spring 59, the pricking device 21 is provided with a translation/rotation transformer comprising two co-operating helical paths 61 and 62.

The first helical path 61 is located on an inner portion of the loading button 31, which button is slidably located within the body 23. By pressing the loading button 31 into the body 23 against the force of a compression spring 63 in the direction of arrow I, a second helical part 62 located on a hollow cylindrical head portion 64 of a pricking rod is frictionally engaged and is driven to rotate in the direction of arrow II as shown in the consecutive Figures 3A - 3C. Upon rotation, the torsion spring 59 is loaded and the head

portion 64 is locked with the spring 59 in loaded condition. Thereto, the head portion 64 comprises a depresseable barb 85 on its circumference which co-operates with a stop notch 86 as shown in Fig. 5A.

5 The head portion 64 is coupled to a pricking rod 65, which in turn carries the wheel 46. The head portion 64 and the pricking rod 65 are coupled via a pin 66 located on the pricking rod 65. The pin 66 is contained in a groove 68
10 located in the head portion 64. During loading, the pin 66 follows a straight portion 68A of the groove 68, such that the pricking rod 65 remains stationary. After locking of the head portion 64 and upon subsequent releasing of the loading button 31, the loading button 31 returns in the direction of arrow III to its neutral position shown in Fig. 3D. The
15 torsion spring 59 is now loaded.

 The pricking device 21 also comprises indexing means 45 to position a fresh lancet 24 in an operating or pricking position P each time the loading button 31 is fully depressed. Thereto, the loading button 31 comprises a rod 69
20 that carries a tooth 70. Upon depression of the loading button 31, the head portion 64 carrying the tooth 70 is deflected by a notch 71, such that the tooth 70 engages a recess 72 of a cogwheel associated with the wheel 46. This causes the wheel 46 to rotate in the direction of the arrow
25 73, such that a fresh, unused lancet 24 is brought in the pricking position P opposite the pricking aperture 32. The axis 48 of the pricking device carrying the wheel 46 may be provided with locking means, e.g. a series of recesses, co-operating with a spring loaded ball attached to the pricking
30 rod 65, to fix the fresh lancet in pricking position P. The rod 69 comprises a recessed portion, such that when the head portion carrying the tooth 70 has passed the notch 71, the rod 69 is freed from the notch 71 and can be retracted without engaging the wheel 46, as is shown in Figs. 4C and
35 4D.

Referring to Figs. 5A and 5B the releasing mechanism 39 is shown. In Fig. 5A the propelling means 22 of the pricking device 21 are loaded and ready to perform a pricking movement. The status indicator 34 for indicating the loaded condition of the propelling means, which is located on the circumference of the head portion 64, is clearly visible through the status window 33. Preferably, the status indicator 34 comprises a bright coloured surface. Similarly, an indicator for indicating an unloaded condition of the propelling means, e.g. an uncoloured surface, can be provided on the opposite side of the head portion 64.

By depressing the firing button 38 in the direction of arrow 80, a protrusion 81 on the firing button 38 engages a bevelled portion 82 of a releasing rod 83, such that the rod 83 moves in the direction of arrow 84. Both the firing button 38 and the releasing rod 83 are spring loaded or otherwise biased in the opposite directions of arrows 80 and 84, respectively, to return to their positions shown in Fig. 5A. As shown in Fig. 5A, the torsion spring 59 is locked in its loaded position by a depressible barb 85 extending radially outwards on the circumference of the head portion 64, which barb 85 is pressed against a stop notch 86. Upon depression of the firing button 38, the releasing rod 83 engages the depressible barb 85 with a second bevelled portion 87. This causes the depressible barb 85 to be depressed radially inwardly into the circumference of the head portion 64, such that the barb 85 is freed from the stop notch 86 and the head portion 64 is free to rotate and the pricking movement can start. The firing button 38 can now be released, which causes the firing button 38 and the releasing rod 39 to return to their original position shown in Fig. 5A under the spring action. To ensure proper operation of the releasing mechanism 39, the firing button 38 may comprise a double releasing rod 83, which is engaged by a corresponding double protrusion 81 on the firing button 38.

Referring to Figs. 6A-6D the pricking movement is shown. After freeing of the barb 85, the head portion 64 is driven by the torsion spring 59 to rotate in the direction of arrow 90. This causes the pin 66 located on the pricking rod 65 to follow the U-shaped portion 68B of the groove 68. This way, rotation of the head portion 64 is transmitted into a substantially linear pricking movement on the pricking rod along the direction of double arrow 91, first outwardly relative to the body in the direction of the closed head of the arrow and, after reaching a reversing point, subsequently inwardly in the direction of the open head of the arrow 91. This embodiment of the propelling means ensures a proper singular linear inward and outward movement of the lancet 24. It should be noted that such a pin-groove mechanism is known as such.

The pricking rod 65 is provided with an axis 48 on its end portion 92. The axis 48 carries the wheel 46 which is located in the cassette 26. During the pricking movement, the cassette 26 is held in place, while the pricking rod 65 slides the wheel 46 out of the cassette, such that a lancet 24 that is in the pricking position P performs a substantially linear pricking movement by moving outwardly through the pricking aperture 32 and backwards. During the outward movement, the pierceable closure 52 surrounding the lancet 24 is pressed against the inner side of the head portion 40, such that it is pierced by the lancet 24 and the lancet 24 becomes uncovered. It shall be clear that the body 23 may alternatively comprise opening means, e.g. a cutter C, for opening a closure surrounding a lancet 24. Also, a cutter C may be provided within the cassette 26 as shown in fig. 3EC.

As discussed before, the head portion 40 can be adjusted along the axis of the body 23, such that the length over which the lancet 24 can maximally protrude through the pricking aperture 32 can be adjusted. During the pricking movement, the axis 48 of the pricking rod 65 and the axial

protrusion 55 of the wheel 46 slides along the slot 54 in the cassette 26. At the end of the pricking movement, the pricking rod 65 is fully retracted in the direction of the open head of arrow 91 and the pricking device is in its unloaded position as shown in Fig. 4A. To ensure proper linear movement of the pricking rod 65 a number of guiding elements 93 is provided.

Referring to Figs. 7A - 7D, the mechanism of the counter 37 is shown. After the depresseable barb 85 on the circumference of the head portion 64 has been freed from the stop notch 86 by being pressed inwards by the second bevelled portion 87 of the releasing rod 83, the head portion 64 is free to rotate in the direction of arrow 90. The depresseable barb 85 subsequently flexes outwardly and engages a cog 94 of a cogwheel 95 associated with the counter dial 88. This causes the counter to rotate in the direction of arrow 90, thus indexing the counter dial 88 such that a new digit 36, e.g. corresponding to the number of used or unused lancets 24 on the wheel 46 becomes visible through the counter window 35. The counter is provided with a resetting mechanism that resets the counter when a new cassette 26 is placed in the cassette holder 44, such that the counter dial 88 indicates the maximum number of unused lancets 24.

Referring to Figs. 8A - 8C it can be seen that the cassette holder 46 comprises a protrusion 97. In closed position, the protrusion 97 is hooked under the counter dial 88, such that when the latch 43 is released, i.e. is moved in the direction of the arrow 101, the cassette holder 44 is kept in closed position, unless the protrusion 97 corresponds with passages 98 in the counter dial 88, such that the protrusion 97 can pass through the passages 98 and the cassette holder 44 can open in the direction of arrow 99. By providing openings in the counter 37 that correspond to the position wherein either all lancets 24 on the circumference of the wheel 46 are used and all lancets on the circumference of the wheel 46 are fresh, it can be prevented that a

cassette 26 can be taken out of the closed cassette holder 44 before all lancets 24 have been used. It shall be clear to the skilled man that such blocking means preventing access to the holder until all lancets of a carrier or a cassette present in the holder have been engaged in a pricking movement, can be designed in many ways.

It shall be clear that the invention is not restricted to the preferred embodiments shown in the drawings. In particular, it shall be clear to the skilled man that many alternatives exist for performing the functions of the various mechanisms discussed and that such mechanisms can be equally well applied to the various embodiments of the pricking apparatus. It shall e.g. be clear that the releasing mechanism can be constructed in various other ways and that a releasing mechanism may also be used with a pricking device arranged for holding a cassette and/or carrier with parallelly disposed lancets. In addition, many functions of the pricking device may be performed or powered electronically. In particular, the indexing means, the counter, and/or the propelling means may be powered and/or controlled electrically. Furthermore, the cassette, the carrier and the holder may have various designs, in particular the number and arrangement of the lancets can be varied. Such embodiments are within the scope of the invention as defined by the appended claims.

Claims

1. Pricking device, comprising a hand holdable body having propelling means for engaging a lancet in a skin puncturing, pricking movement relative to said body, characterised in that the pricking device is arranged to hold
5 a plurality of lancets and comprises indexing means for indexing said lancets, such that each lancet can be positioned in an operating position wherein it can be engaged in a pricking movement.
2. Pricking device according to claim 1, wherein the
10 indexing means are operatively coupled to the propelling means, such that during loading and/or releasing of the propelling means the indexing means are actuated.
3. Pricking device according to claim 1 or 2, wherein the indexing means comprise locking means for locking a
15 lancet in the operating position.
4. Pricking apparatus according to any of claims 1-3, wherein the pricking device comprises a holder for holding a carrier and/or cassette comprising a plurality of lancets.
5. Pricking device according to claim 4, wherein the
20 holder is operatively coupled to blocking means for blocking access to the holder until all lancets of a carrier or cassette present in the holder have been engaged in a pricking movement.
6. Pricking device according to any of claims 1-5, wherein opening means are provided for opening a closure
25 surrounding a lancet.
7. Pricking means according to claim 6, wherein the opening means comprise a cutter.
8. Pricking device according to any of the preceding
30 claims, comprising a counter for indicating the number of lancets of the plurality of lancets that have been engaged and/or that remain to be engaged.

9. Pricking device according to any of the preceding claims, wherein an indicator is provided for indicating a loaded and/or an unloaded status of the propelling means.
10. Carrier for use in a pricking device according to any
5 of the preceding claims, which carrier comprises a plurality of lancets.
11. Carrier according to claim 10, wherein the lancets are disposed with their longitudinal axes substantially parallel.
- 10 12. Carrier according to claim 10, wherein the lancets are disposed with their longitudinal axes substantially outwardly relative to a central portion.
13. Carrier according to claim 12, wherein the lancets are disposed radially outwardly relative to said central
15 portion.
14. Carrier according to any of claims 10-13, wherein each lancet is provided with a closure providing said lancet with an airtight, preferably sterile environment.
15. Carrier according to claim 14, wherein said closure
20 is puncturable.
16. Carrier according to claim 15, wherein said closure comprises a puncturable foil.
17. Carrier according to any of claims 10-16, wherein blocking means are provided for blocking insertion of the
25 carrier into a pricking device when at least one of the lancets have been engaged in a pricking movement.
18. Cassette for use in a pricking device according to any of claims 1-9, comprising a plurality of apertures, each comprising at least one lancet.
- 30 19. Cassette for use in a pricking device according to any of claims 1-9, comprising at least one aperture comprising at least one carrier according to any of claims 9-17.
20. Cassette according to claim 19, wherein said at least
35 one carrier is slidably and/or rotatably disposed within said at least one aperture.

21. Cassette according to claims 14 and 20, wherein said cassette comprises opening means for opening said closures.
22. Cassette according to claim 20, wherein said opening means comprise a cutter.

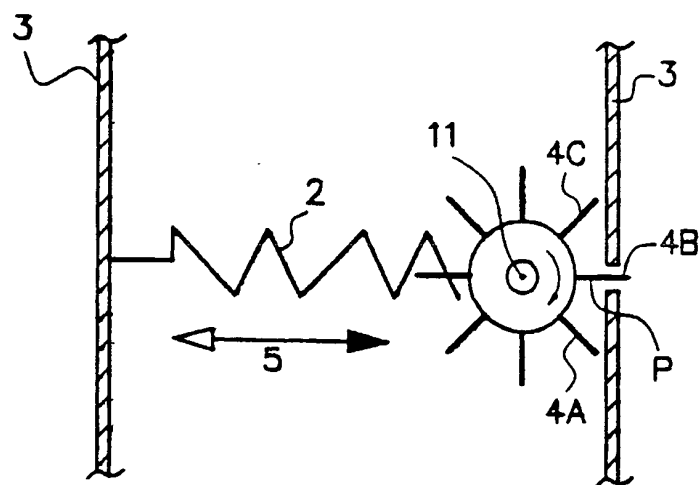


FIG. 1B

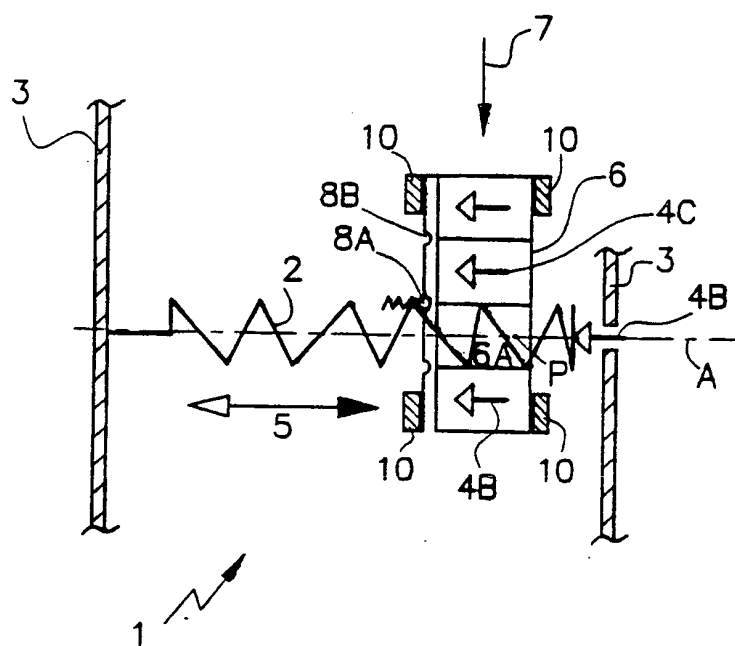


FIG. 1A

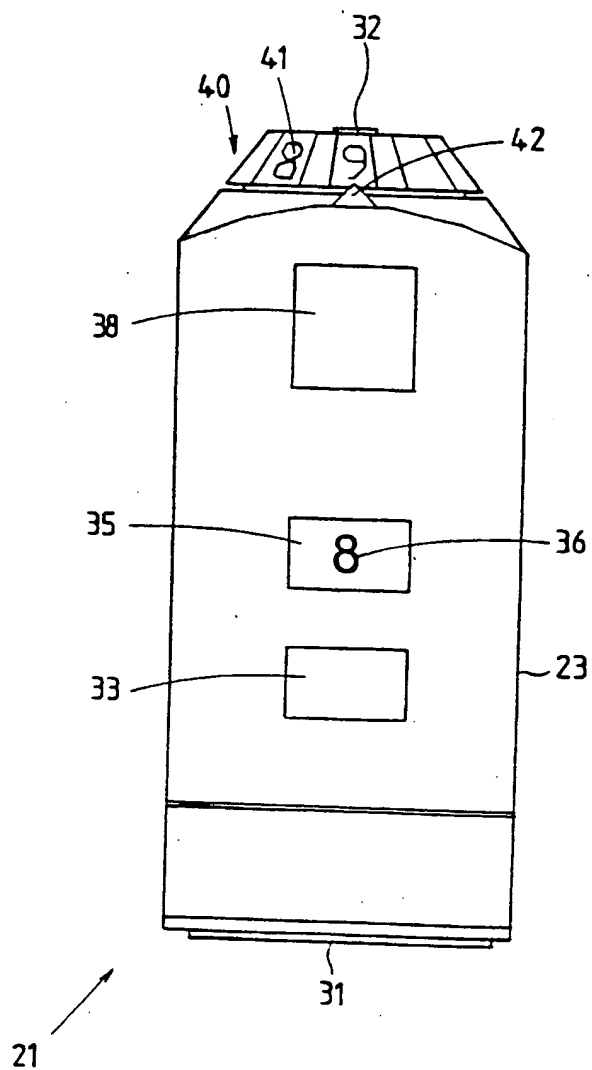


FIG. 2A

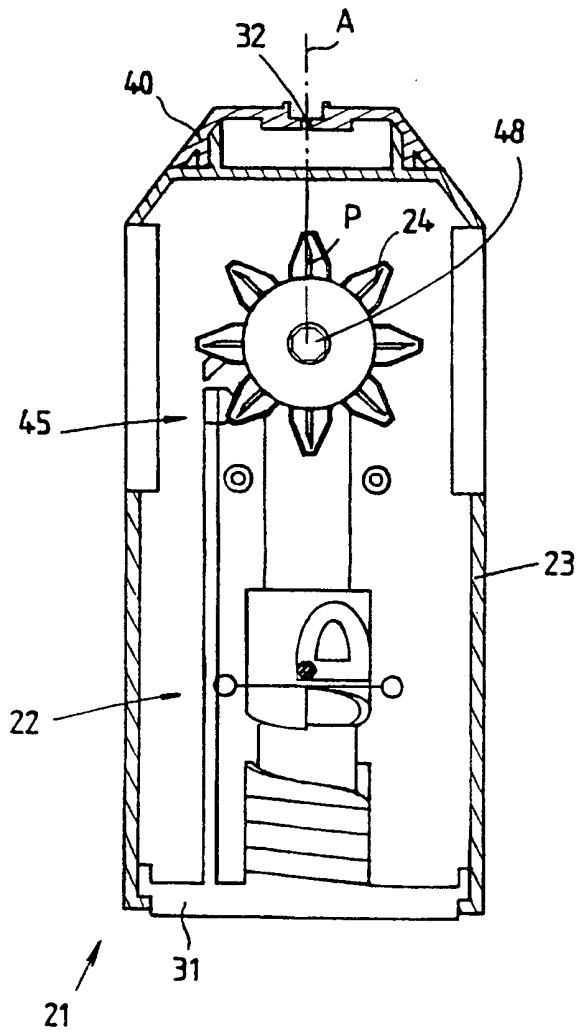


FIG. 2 B

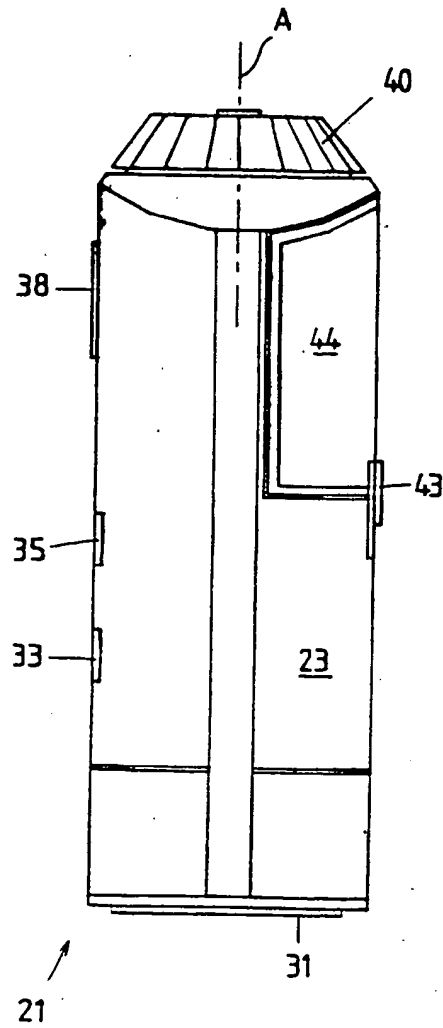


FIG. 2C

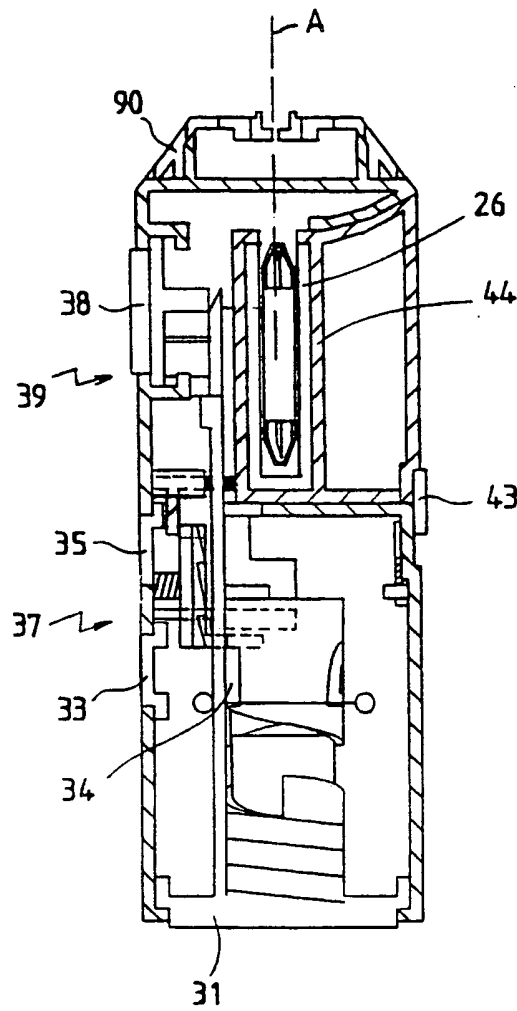


FIG. 20

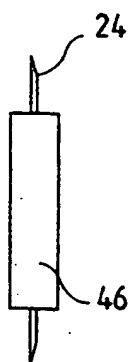


FIG. 3AA

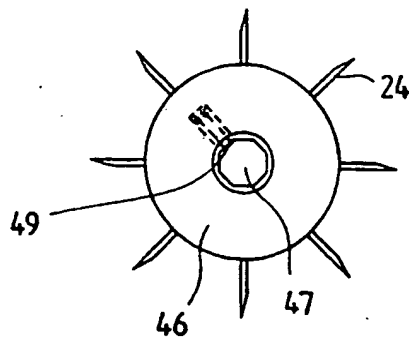


FIG. 3AB

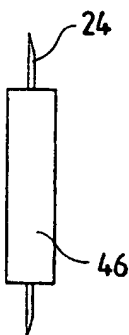


FIG. 3BA

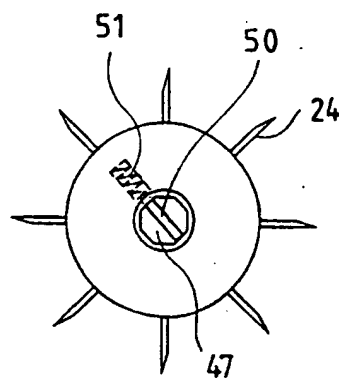


FIG. 3BB

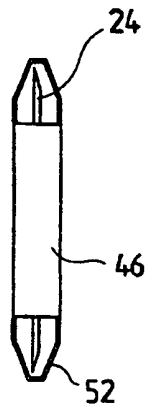


FIG. 3CA

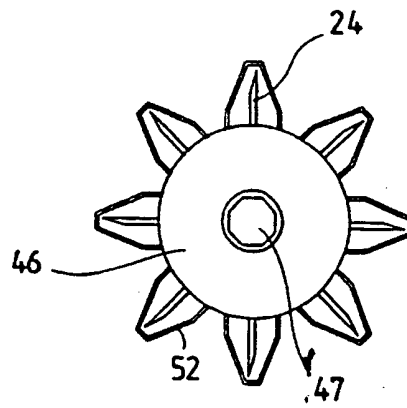


FIG. 3CB

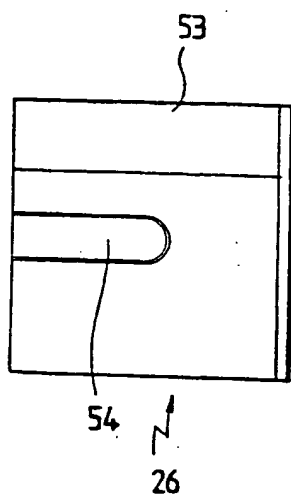


FIG. 3DA

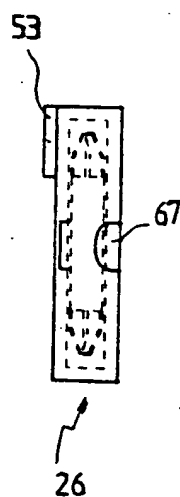


FIG. 3DB

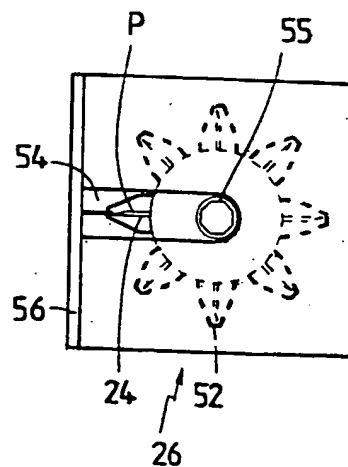


FIG. 3DC

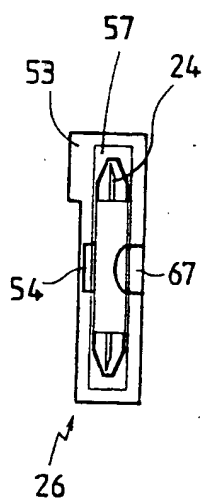


FIG. 3EA

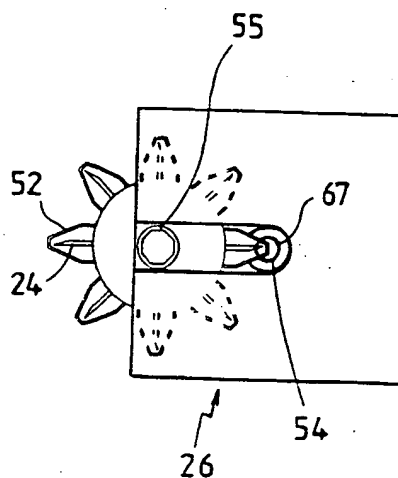


FIG. 3EB

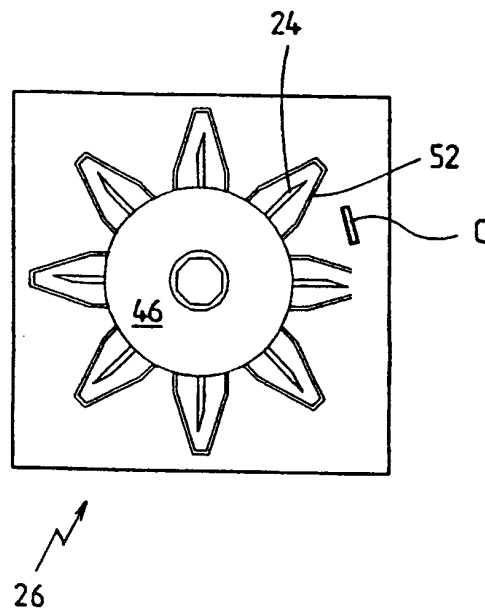


FIG. 3EC

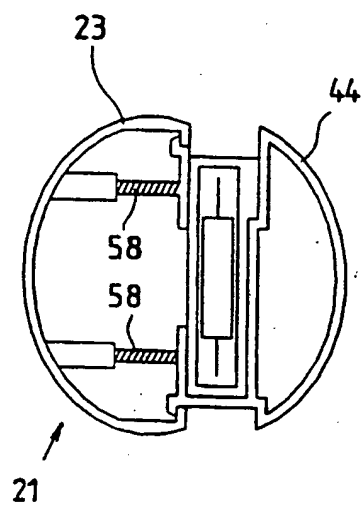


FIG. 3FB

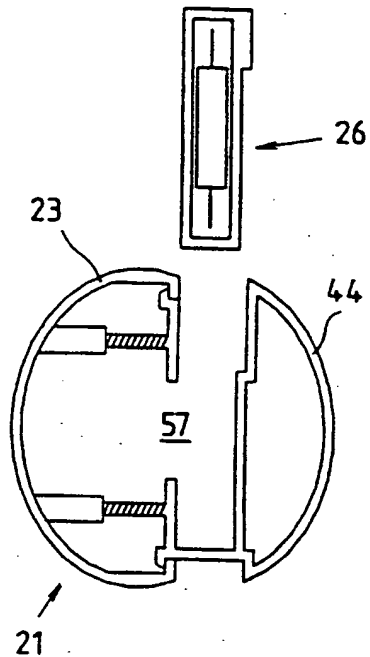
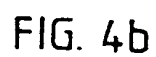
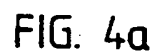


FIG. 3FA



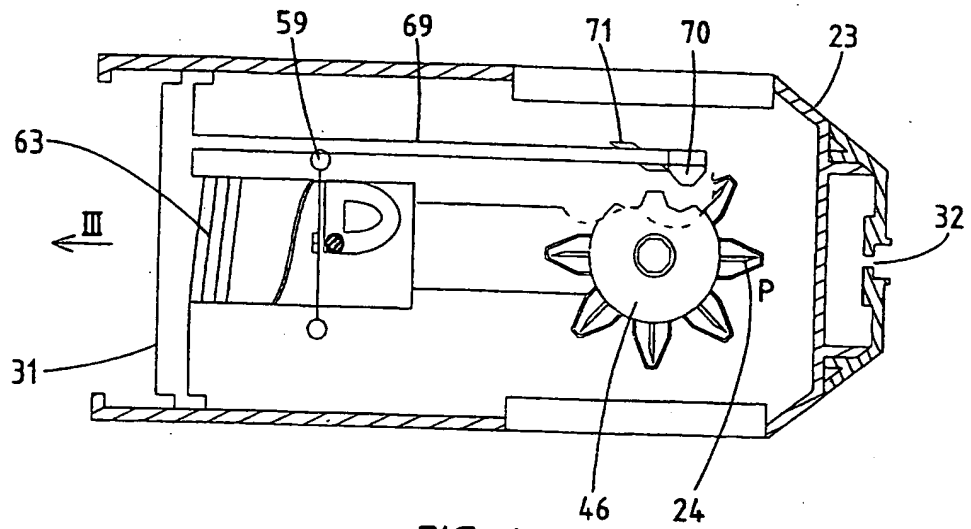


FIG. 4c

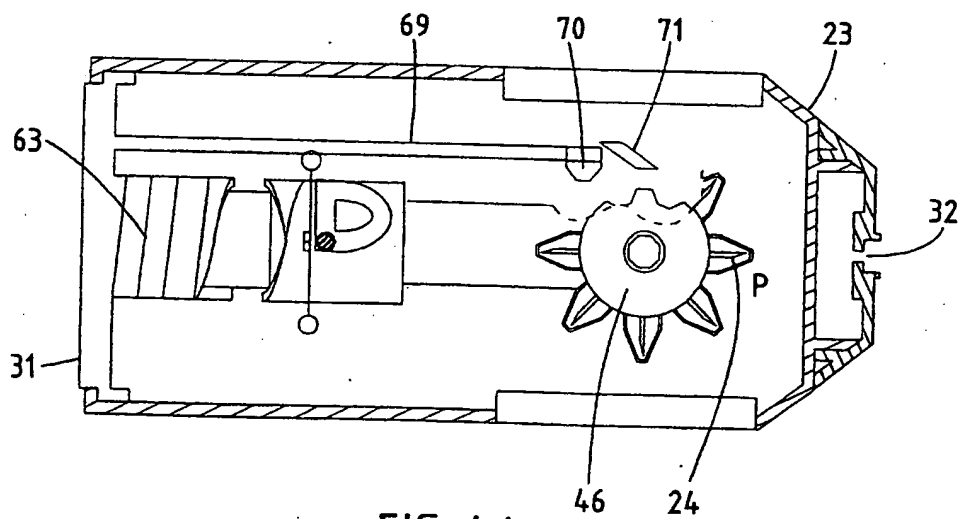


FIG. 4d

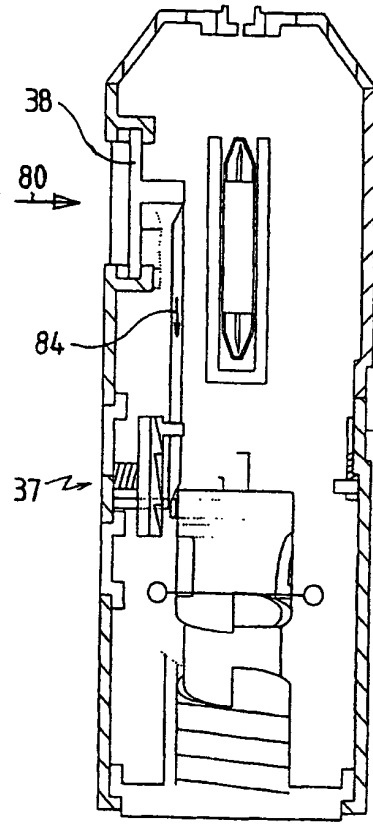


FIG. 5a

FIG. 5b

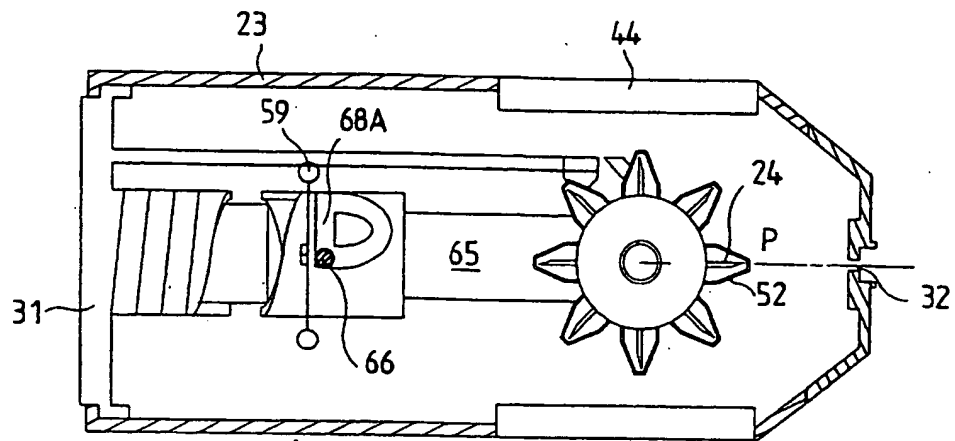


FIG. 6a

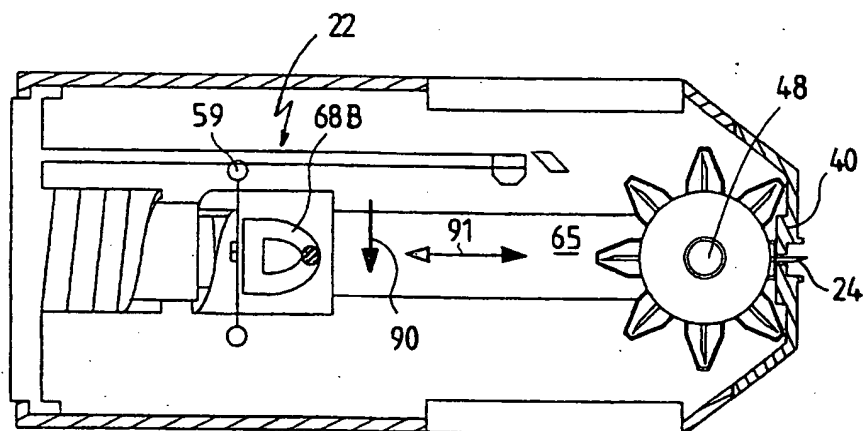


FIG. 6b

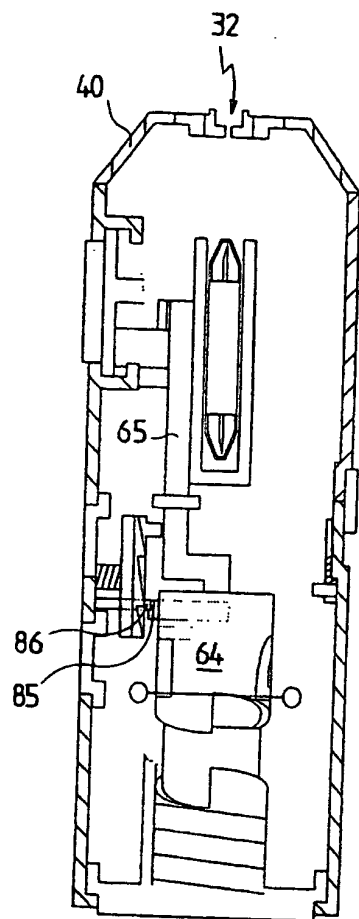


FIG. 6c

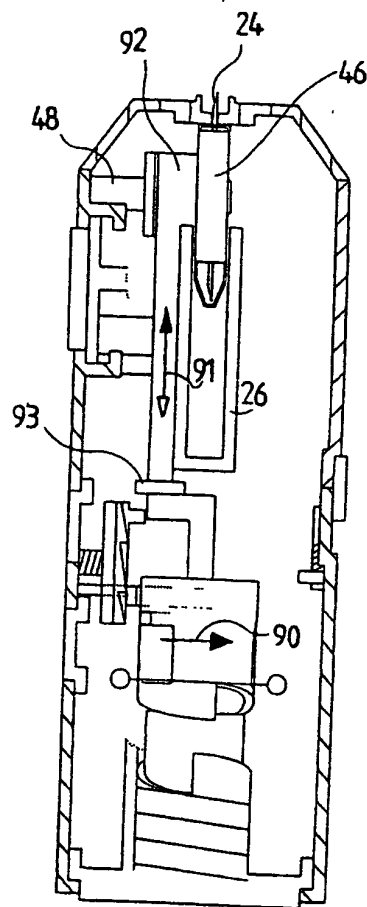


FIG. 6d

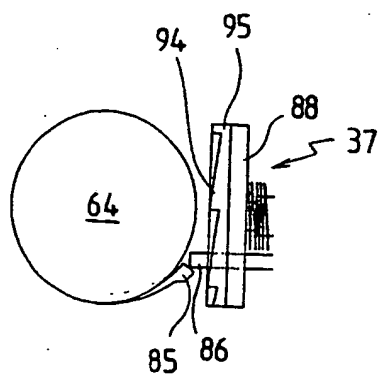


FIG. 7a

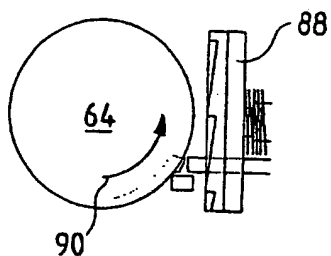


FIG. 7b

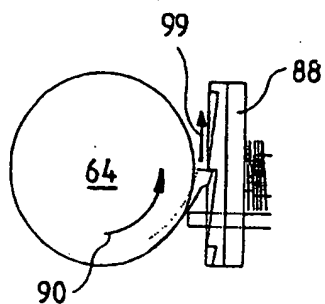


FIG. 7c

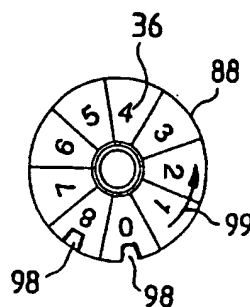


FIG. 7d

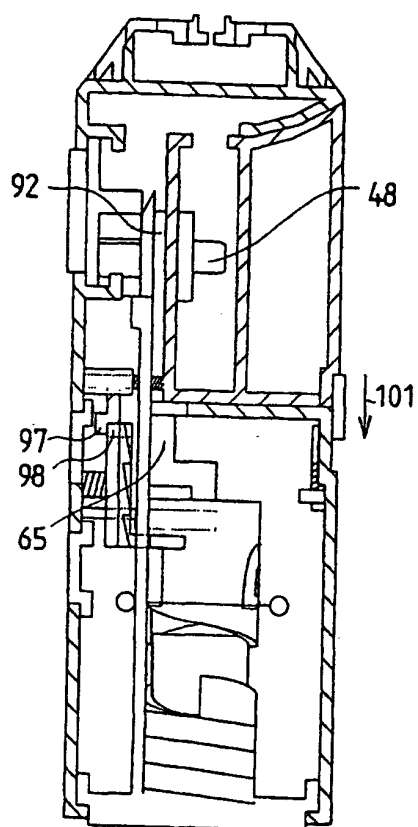


FIG. 8a

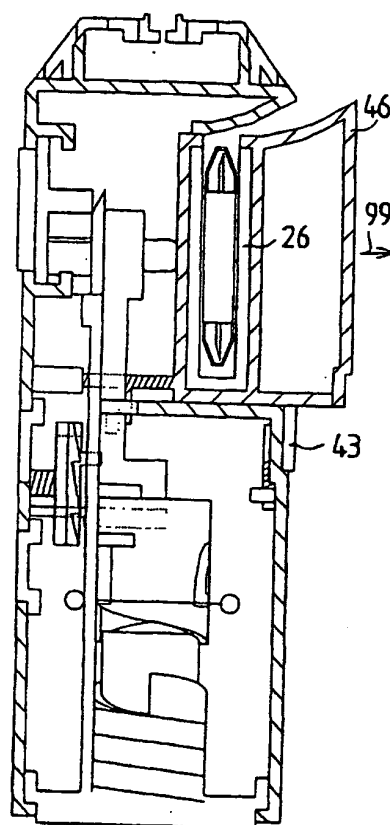


FIG. 8b

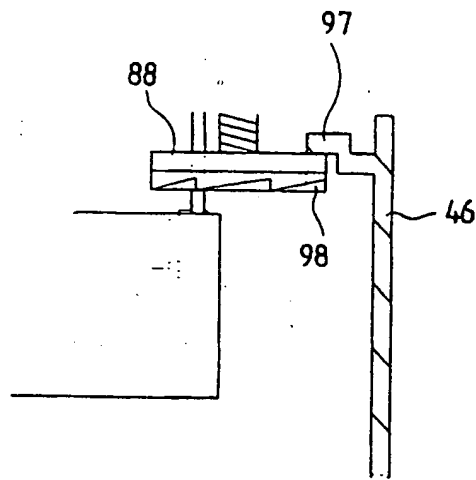


FIG. 8c

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 99/00403

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61B5/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 28 03 345 B (EISINGER) 13 June 1979 (1979-06-13) the whole document	1-4, 6, 10, 11, 14-16, 18-21
X	FR 1 065 689 A (MOLLEN) 28 May 1954 (1954-05-28) the whole document	1-4, 10, 11
X	US 4 794 926 A (INVICTUS) 3 January 1989 (1989-01-03) the whole document	10, 12-16

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "A" document member of the same patent family

Date of the actual completion of the international search

29 February 2000

Date of mailing of the international search report

08/03/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3018

Authorized officer

Lemerrier, D

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 99/00403

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 2803345	B	13-06-1979	NONE	
FR 1065689	A	28-05-1954	NONE	
US 4794926	A	03-01-1989	NONE	

This Page Blank (uspofo)